

Informational Leaflet

COOK INLET AREA PINK SALMON FORECAST STUDIES 1964-1966

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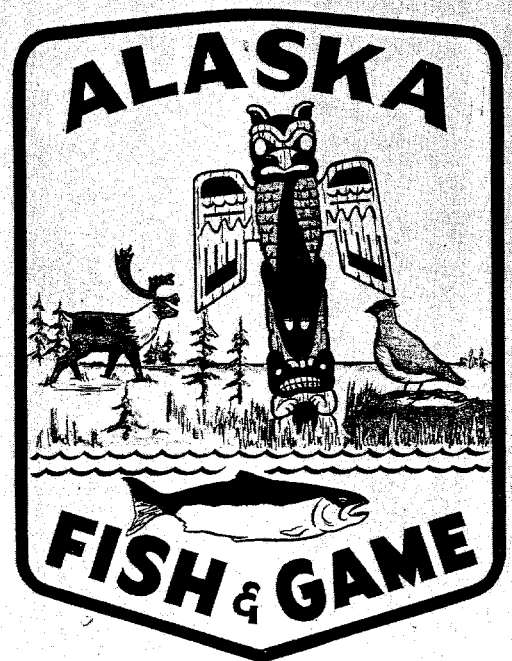
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INTRODUCTION

The Cook Inlet Area commercial salmon fishing harvest consists of all five species of the Pacific salmon. Since 1960 pink salmon have comprised 48 percent of the total catch of fish, with sockeye salmon 27 percent, chum salmon 19 percent, coho salmon 6 percent, and king salmon .4 percent. The dominant cycle of pink salmon in Cook Inlet occurs during even-numbered years. Catches since 1960 have ranged from a high in 1962 of 4.9 million fish to a low in 1965 of .12 million.

The Cook Inlet Area is comprised of seven regulatory fishing districts (Figure 1).

The Northern district pink salmon fishery is comprised entirely of set gill net gear. Figure 2 shows the catch of pink salmon in the Northern district. The largest catch of pink salmon since 1951 was the 1964 catch of 586,000 fish. The lowest catch occurred during 1957 when less than 2,000 pinks were harvested. The Susitna River drainage is the largest producer of pink salmon in the district. During the large even-year runs, fish utilize most streams along both sides of Cook Inlet, Turnagain and Knik Arms. Pre-emergent fry sampling was conducted in the Talachulitna River of the Susitna River drainage and the data is presented in the results section.

Commercial salmon fishing in the North and South Central districts is conducted by set gill nets along the beaches, drift gill nets in the offshore waters, and purse seines in Chinitna Bay only. Catches of pink salmon since 1951 have fluctuated between a high of 2.6 million in 1964 to a low of 10,500 in 1959 (Figure 2). The Kenai and Kasilof Rivers are the most important pink salmon producing streams in the districts. Both of these streams are glacial in nature. Pre-emergent fry sampling has not been conducted in these districts.

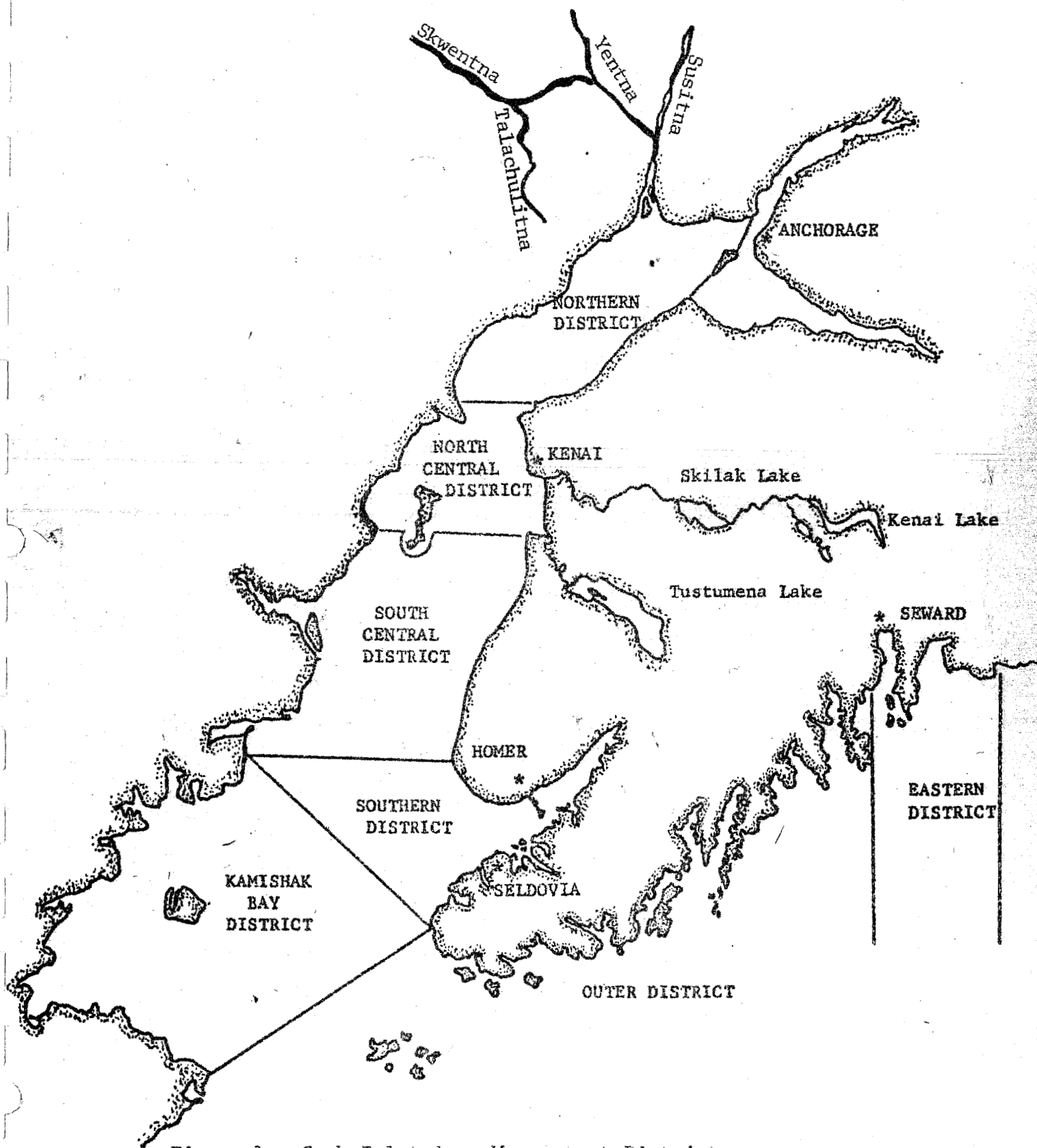


Figure 1. Cook Inlet Area Management Districts.

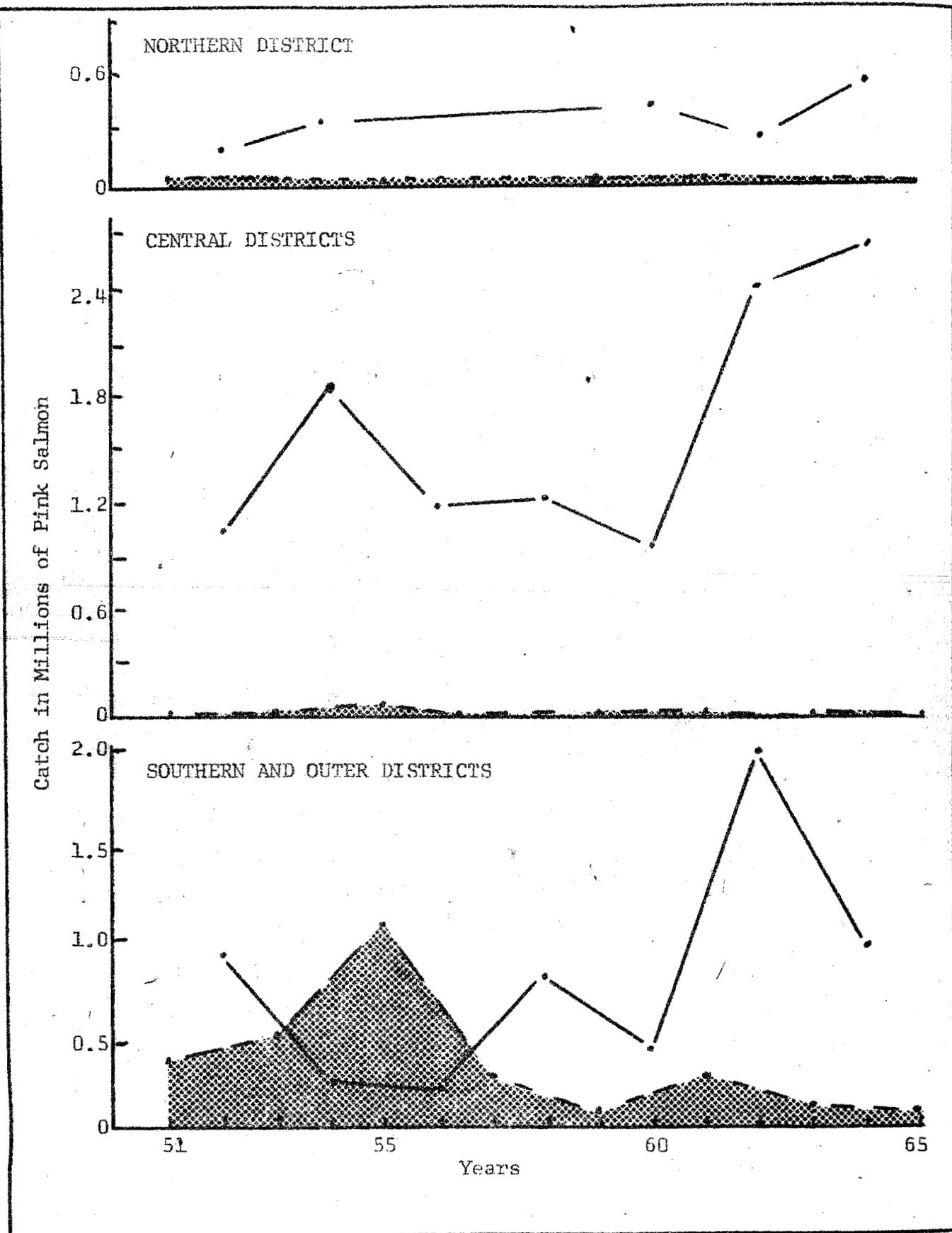


Figure 2. Odd and even-year commercial catches of pink salmon in three districts of Cook Inlet, 1951-1965. Even-year catch solid line; odd-year catches broken line (shaded).

Purse seines are the only type gear utilized in the Kamishak Bay district for commercial salmon harvest. Lack of safe anchorages and no close market facilities make seining in the area unattractive. Catches of pink salmon have fluctuated from zero in years of no fishing effort to a high of 82,000 fish in 1963. Pink salmon spawn in the majority of the streams in the district. The most important pink salmon stream in the area is Bruin Bay River. No pre-emergent fry sampling has been conducted in the Kamishak Bay district.

In the Southern and Outer districts, the majority of the pink salmon are taken by purse seines; however, portions of the Southern district are open to set gill nets. Figure 2 compares the odd- and even-year commercial catches of pink salmon in the Southern and Outer districts. Since 1958, the even-year cycle has been the dominant year class; however, the fluctuation between odd- and even-year catches is not as variable in these districts as in the Northern and Central districts. Since 1951, the largest pink salmon harvest was in 1962, when 2.3 million fish were caught. The lowest catch occurred in 1959, when 119,000 fish were taken. Unlike the major pink salmon spawning streams in Cook Inlet north of Anchor Point, spawning riffles in these districts are located in the intertidal and lower freshwater portions of the streams. In 1963 ten streams in the area from Kachemak Bay to Port Dick were selected for pink salmon studies. Figure 3 shows the location of the study streams. Pre-emergent fry sampling has been conducted on six to ten of the study streams since 1963. The data and conclusions from the sampling are presented in the results section.

The Eastern district has produced small catches of pink salmon in the years since 1956. Less than 1,000 fish have been taken annually, except 1960 when 9,000 pinks were harvested. No pre-emergent fry sampling has been conducted in this district.

METHODS

Pre-emergent fry sampling methods were thoroughly described in Alaska Department of Fish and Game Informational Leaflet No. 36 (Noerenberg, 1964). No changes in procedures in the Cook Inlet area were made in 1965. The number of sample points and area of sampling has gradually been adjusted to provide better coverage of the utilized spawning area.

Gravel shift and freezing level indicators were described in Alaska Department of Fish and Game Informational Leaflet No. 65 (Davis, 1965). Three of the ten study streams were checked for gravel shift and freezing level during the winter of 1964-65. The conclusions of the study are presented in the results section.

The periodic surveys of 1964 escapements in the ten study streams of the Southern and Outer districts are presented in Table 1. With the exception of

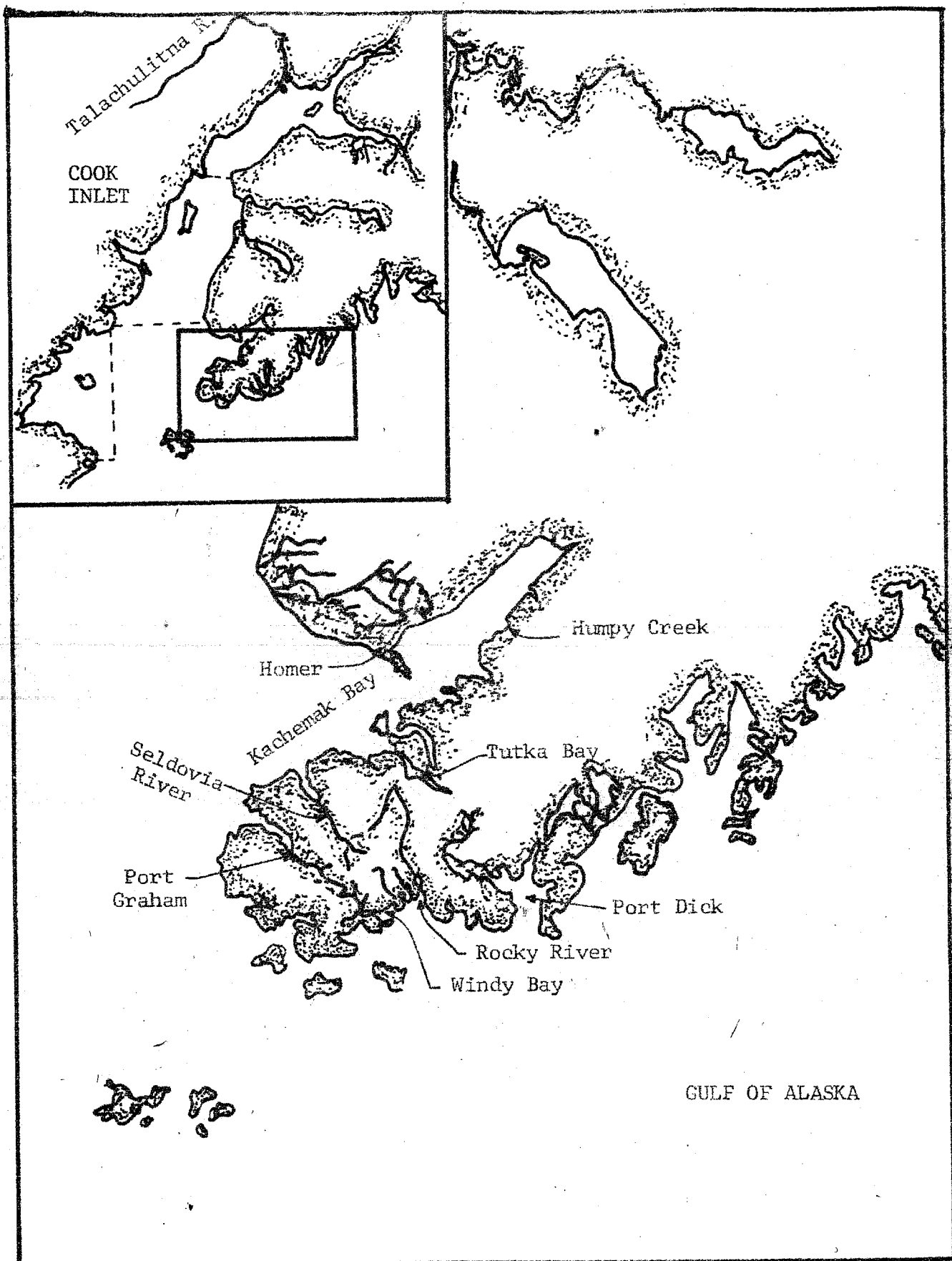


Figure 3. Cook Inlet pink salmon study stream locations.

TABLE 1. 1964 PINK SALMON ESCAPEMENT ESTIMATES ^{1/}
SAMPLE STREAMS IN SOUTHERN AND OUTER DISTRICTS OF COOK INLET

Stream	On or before July 13	July 15	July 18	July 20	July 25	July 26	July 30	July 31	Aug 6	Aug 7	Aug 10	Best Escapement Estimate
Humpy Creek												18,500 ^{2/}
Tutka Bay			400		4,000				20,000		20,000	20,000
Seldovia		2,000	3,000	9,000		35,000		70,000	46,000			60,400
Port Graham	100	2,000						10,000	12,500			16,000
Windy Left	3,000	7,000		3,450					3,500			7,700
Windy Right			4,500	6,000					3,000			6,200
Rocky River		5,000			4,800				14,000		76,000	80,000
Port Dick Creek	6,000		15,000			7,000	20,000		11,000	14,000	30,000	31,500
Middle Creek											2,000	2,000
Island Creek			1,500				2,000			30,000		30,000
TOTAL												272,300

^{1/} Foot and aerial surveys by various observers.

^{2/} Weir count - 8,000 male, 10,500 female.

a weir count for Humpy Creek, the surveys were conducted either by aircraft or foot.

Best escapement estimates were determined by graphing the available daily counts of pink salmon and calculating the area under the graph. This figure was then divided by the estimated number of days the pink salmon spend in the stream, which is 24.5. The 24.5 figure was calculated by graphing daily stream counts on Humpy Creek in the stream above a weir. The total weir count for the season was divided into the area under the graph.

RESULTS

The effects of the land subsidence following the March 1964 earthquake on the ten pink salmon study streams of Cook Inlet are discussed in the Department publication, Post-Earthquake Fisheries Evaluation (Davis, 1965). It was observed in the majority of the study streams that pink salmon tended to spawn farther upstream following the land subsidence. This was caused by salt water covering a larger portion of the spawning area compared to pre-earthquake tide levels, thereby forcing the salmon upstream to freshwater covered riffles.

In the case of the Tutka Bay Lagoon stream, pink salmon previous to the earthquake spawned as far upstream as the water velocity allowed them. Following the land subsidence and subsequent loss of a portion of the intertidal spawning riffle, pink salmon were forced into a smaller spawning area.

In the other study streams where water velocity barriers are not apparent, salmon appeared to move into upstream reaches of the streams.

The Talachulitna River is a clearwater tributary of the glacial Susitna River. The entire 35 mile length of the river is utilized by pink salmon for spawning. Pre-emergent fry sampling was conducted in the spring of 1965 following the 1964 estimated escapement of one million pink salmon. Due to extensive ice coverage on the river, sampling was possible only in the upper few miles of the stream. Results of the upstream sampling are presented in Table 2. The sampling was conducted utilizing a four-place helicopter for transportation.

Pink salmon escapement, number of sample digs and mean number of fry per square meter on each of the study streams for the years 1962, 1963, and 1964 are presented in Table 2.

In 1962 and 1963 escapement counts indicate peak estimates of pink salmon and do not take into consideration recurring waves of spawners. The 1964 escapement counts were calculated as explained in the methods section of this report. The number of sample digs has been adjusted each year to provide

TABLE 2. PINK SALMON ESCAPEMENTS AND PRE-EMERGENT FRY OBSERVATIONS, 1962, 1963
AND 1964

	1962 RUN			1963 RUN			1964 RUN		
	Esc. Count	No. of Samples	Mean Fry Per Sq. Meter	Esc. Count	No. of Samples	Fry	Esc. Count	No. of Samples	Fry
Humpy	56,000	65	118.4	34,684	86	86.4	18,500	153	199.1
Tutka	30,000	13	139.9	10,000	26	72.3	20,000	55	195.8
Seldovia	50,000	28	231.4	15,000	35	84.3	60,400	95	284.1
Pt. Graham	50,000	45	279.9	2,000	--	----	16,000	50	242.1
Windy Left)	25,000	--	-----	4,500	--	----	7,700	50	100.1
Windy Rt.)				4,900	--	----	6,200	50	75.3
Rocky	200,000	--	----	12,000	26	0.0	80,000	87	131.3
Port Dick)	55,000	25	240.0	16,000	18	5.4	31,500	70	222.7
Island)		30	113.0	3,600	33	0.0	30,000	21	80.7
Middle)		--	-----	1,500	31	0.0	2,000	25	36.6
Talachulitna (Susitna Drainage)							60 ^{1/}	234.78 ^{1/}	
Totals or Means	466,000	206	184.4	97,684	255	47.8	272,300	656	180.9 ^{2/}

^{1/} Not included in total.

^{2/} Figure weighted by number of samples in each stream.

better sample coverage of the utilized spawning area. The mean number of fry per square meter is the average for the utilized spawning area in the sampled streams.

Table 3 lists the streams, sampling dates and number of gravel shift and freezing level setups for each stream studied during the winter of 1964-65. Seldovia River experienced some minor gravel shift in the upper portion of the intertidal zone. Average pre-emergent fry densities were observed in the area of gravel shift.

One shallow riffle in the upper intertidal zone of Port Graham River had fry mortality apparently from freezing. The freezing vials in the riffle area were all broken and pink fry removed from the gravel were dead. This one riffle area was the only portion of the stream where fry mortality was observed.

TABLE 3. STREAMS, SAMPLING DATES AND NUMBER OF GRAVEL SHIFT AND FREEZING LEVEL SETUPS FOR 1964-1965 WINTER.

Stream	Number Setups	Planting Date	Recovery Date	Results
Humpy Creek	30	10/14/64	3/29/65	Indicators showed no gravel shift or freezing.
Seldovia River	20	10/13/64	3/25/65	Gravel shift occurred in upper IT zone, (4-6 inches deposited over setup). Indicators showed no freezing.
Port Graham	20	10/15/64	3/7/65	Ping pong indicators showed no gravel shift. Fry mortality occurred in upper intertidal zone, freeze vials in area all broken.

DISCUSSION AND CONCLUSIONS

Table 4 summarized the pink salmon catches, escapements, and pre-emergent fry abundance averages in the study area, 1962, 1963, and 1964. The pre-emergent fry density for the 1964 spawning year is slightly lower than the fry density for the 1962 spawning year.

Since the 1962 fry density of 184.4 yielded a return of 1,306,185 pink salmon, it is estimated that the 1964 fry density of 180.9 will proportionately

yield a return of 1,300,000 pink salmon to the Southern and Outer districts in both catch plus escapement.

TABLE 4. SUMMARY OF PINK SALMON CATCHES, ESCAPEMENT AND PRE-EMERGENT FRY ABUNDANCE RATIOS IN THE STUDY AREA, 1962, 1963 AND 1964.

Spawning Year	Catch	10-Stream Esc. Index	Pre-emergent Fry Density Sq. Meter Means	Return 10-Stream Catch and Esc.
1962	2,113,570	466,000	184.4	1,306,185 (1964)
1963	121,026	97,684	47.8	255,000 (1965)
1964	1,033,885	272,300	180.9	1,300,000 (1966) ^{1/}

^{1/} Estimated forecast of 1966 catch plus escapement.

The estimated distribution of the catch plus escapement for the various bays in the Southern and Outer districts is presented in Table 5. The number of square meters indicates the actual area utilized by pink salmon in the streams.

The estimate of the return to individual bays is based on the average percent return from the fry outmigration from the 1962 and 1963 parent years for all bays except Windy and Rocky Bays. Data from previous years' fry outmigration is not available for these bays; therefore, return estimates were made from even-year catch plus escapement averages. The Port Dick Bay streams, Port Dick Creek, Island Creek, and Middle Creek, were grouped together for this estimate since catch figures are not separated within the bay.

The 1963 parent year fry sampling in Port Dick streams indicated low levels of fry abundance within the sample area. The sample area had been affected by the tsunami following the Good Friday earthquake. It is apparent from the 1965 return that pre-emergent fry sampling had not covered utilized spawning areas. The sample areas on these streams has been adjusted accordingly.

TABLE 5. PINK SALMON FRY DENSITY - RETURN RELATIONSHIPS WITH ESTIMATED 1966 RETURN

Parent Year	Fry Density	Outmigrating Fry	Year	Catch	Return Escapement	%
<u>Humpy Creek - *19,700 m²</u>						
1962	118.4	2,332,480	1964	53,535	18,500	3.08
1963	86.4	1,702,080	1965	6,707	28,000	2.04
1964	199.1	3,922,270	1966	(Calculated)	100,000	
<u>Tutka Lagoon - *4,600 m²</u>						
1962	139.9	643,540	1964	100,935	20,000	18.7
1963	72.3	332,580	1965	44,599	20,000	19.4
1964	195.8	900,680	1966	(Calculated)	171,000	
<u>Seldovia River - *12,000 m²</u>						
1962	231.4	2,776,800	1964	37,357	60,400	3.52
1963	84.3	1,011,600	1965	18,941	30,000	3.85
1964	284.1	3,409,200	1966	(Calculated)	119,000	
<u>Port Graham - *8,000 m²</u>						
1962	279.9	2,400,000	1964	36,402	16,000	2.18
1963	-----	-----	1965	10,060	1,500	
1964	242.1	1,936,800	1966	(Calculated)	42,000	
<u>Windy Bay (2 streams) - *9,400 m²</u>						
1962	-----	-----	1964	68,567	13,900	
1963	-----	-----	1965	5,435	12,000	
1964	87.7	824,380	1966	(Estimated)	70,000 ^{1/}	
<u>Rocky River ^{2/}</u>						
1962	-----	-----	1964	53,186	80,000	
1963	0.0	-----	1965	141	300	
1964	131.3	-----	1966	(Estimated)	100,000 ^{1/}	

* Utilized spawning area

^{1/} Estimated from catch plus escapement data

^{2/} Utilized spawning area not measured

TABLE 5. PINK SALMON FRY DENSITY - RETURN RELATIONSHIPS WITH
ESTIMATED 1966 RETURN (Continued)

	PARENT YEAR 1962		1964 RETURN	
	<u>Fry Density</u>	<u>Outmigrating Fry</u>	<u>Catch</u>	<u>Escapement</u>
Port Dick Creek, *7,600 m ²	240.0	1,824,000		31,500
Island Creek, *3,600 m ²	113.0	406,800		30,000
Middle Creek, *1,500 m ²	176.0	264,000	524,883	2,000
TOTAL		2,494,000		23.59

	PARENT YEAR 1963		1965 RETURN	
Port Dick Creek	5.4 $\frac{1}{2}$	41,040	15,337	50,000
Island Creek	0.0 $\frac{1}{2}$	-----	-----	500
Middle Creek	0.0 $\frac{1}{2}$	-----	-----	500

	PARENT YEAR 1964		1966 RETURN (Calculated)	
Port Dick Creek	222.7	1,692,520		
Island Creek	36.6	131,760		
Middle Creek	80.7	121,050		
TOTAL		1,945,340		459,000

* Utilized spawning area

$\frac{1}{2}$ / Sampling conducted following earthquake. Sample area had been affected by tsunami.

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